DELIVERABLE D.T2.1.1

Identification of barriers / challenges in different Central European Countries on cultural heritage vulnerability

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CONTENTS

1. INTRODUCTION

1.1. Objective and scope

WP T2 C*ultural heritage vulnerability in emergency situations*, under the activity A.T2.1, concentrates on the identification of the critical elements which can be subject of improvement in the resilience and risk management of cultural heritage exposed to extreme events. In this context, the deliverable D.T2.1.1 has the scope of highlighting the main problems, barrier and challenges existing at Central European level in the resilience and risk management of cultural heritage facing natural disasters.

More specifically this report has the following objectives:

- To map the situation in the resilience and risk management of cultural heritage in Central European countries.
- To review existing policies and their changes adopted in the past in order to improve and optimise the efficiency and adequacy of risk management measures.
- To outline the essential barriers to the enforced resilience and risk management strategies in Central European countries.
- To evaluate experienced damage to cultural heritage assets as a basis for the assessment of their vulnerability.
- To identify challenges on cultural heritage vulnerability in Central Europe.
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The next section describes the structure of the report.

1.2. Structure of the report

The deliverable D.T2.1.1 *Identification of barriers/challenges in different countries on cultural heritage vulnerability* is composed of the following sections: section 2 introduces the basic principles and measures of resilience and risk management for cultural heritage outlining the enforced strategies in the countries involved in the ProteCHt2SAVE project (i.e. Austria, Hungary, Italy, Czech Republic, Croatia and Slovenia) providing also insights on past changes to risk management policies; section 3 summarises the extreme events commonly experienced in such countries, discerning among three different scales (site, regional, national); it also presents the observed or expected effects of these extreme events on cultural heritage sites or landscapes, built heritage and moveable heritage. Section 4 identifies the main barriers and challenges to the resilience and risk management policies implemented at local (site), regional and national level in the different countries considered. Finally, section 5 draws main conclusions on the common challenges experienced in Central Europe for the sake of determining the criticalities which need to be addressed in the context of cultural heritage protection strategies and enforced policies. Selected damage examples are presented in the Annex.

2. RESILIENCE AND RISK MANAGEMENT OF CULTURAL HERITAGE

Risk management consists in the identification, evaluation and prioritization of risks which is accompanied by the coordinated application of resources to minimize, monitor and control the impact of adverse events [Hubbard 2009].

The meaning of **vulnerability** [Green, 2004] has changed in recent years from its original definition, especially when related to the concept of resilience. Nowadays this term identifies the extent to which a system is susceptible to damaging action due to exposure in conjunction with its ability (or inability) to cope, recover, or basically adapt. This can be expressed mathematically as follows: Vulnerability = Exposure + Susceptibility – Resilience. Exposure is defined as the predisposition of a system to be disrupted by a disastrous event due to its location in the same area of influence. Exposure can be understood as the values that are present at the location where the disaster might occur. These values can be goods, infrastructure, cultural heritage, agricultural fields or mostly people. The indicators for this component can be divided into two categories; the first one covers the exposure of different elements at risk and the second one gives details on the general characteristics of the disaster. Susceptibility relates to system characteristics, including the social context of disaster damage formation. Especially the awareness and preparedness of affected people regarding the risk they live with (before the disaster), the institutions that are involved in mitigating and reducing the effects of the hazards and the existence of possible measures, like - for example - evacuation routes or temporary measures to be used during the floods.

Resilience, instead, is defined as the capacity of a system to endure any perturbation, like disaster damage, maintaining significant levels of efficiency in its social, economic, environmental and physical components.

This section outlines the principles on which risk management theory is grounded, summarizing the currently enforced strategies in Central European countries with insights on the relevant changes or improvements adopted throughout the years and why these were implemented.

2.1. Principles and measures

There exist a number of principles, guidelines and recommendations at European, national and regional level provided by authorities, professional bodies and research centres concerning the management of risks and the implementation of resilience measures [e.g. EC 2013, FERMA 2003] and some are specifically available for cultural heritage protection against natural disasters and extreme weather actions [for example EC 2014, Stovel 1998 and CHERPLAN 2014]. According to the standard ISO 31000 [ISO 31000:2009], risk management strategies should explicitly address uncertainty in a systematic and structured manner based on the best available information. These strategies should also be transparent and inclusive, involving all stakeholders and right holders, concentrating mainly on human factors at risk; finally they should be dynamic, iterative and responsive to change allowing constant improvement and enhancement.

In the context of cultural heritage protection, resilience and risk management should follow a series of specific requirements. Firstly, a robust approach to risk-preparedness for cultural heritage requires a planning framework which should consider three main phases, namely preparedness, response and recovery. Secondly, conservation principles must be ensured as an integral part of the overall set of criteria applied in all phases of risk management. For example documentation strategies before, during and after emergencies should be considered as well as context-specific legal and normative

instruments should be enforced by applying, for instance, flexible building codes and standards to post-disaster assessments and interventions or special funding schemes for fast recovery purposes.
Thirdly, for an effective protection of cultural heritage at risk it is fundamental the provision of an advance planning and preparation concentrating on the identification of heritage properties, the assessment of their risks and the drafting of appropriate mitigation, response and recovery measures. Preparedness requirements should be met in heritage buildings by means which will have the least impact on heritage values without constraining excessively the effectiveness of other risk and hazard mitigation measures. In fact, it should be underlined that while securing heritage features constitutes a high priority during emergency situations, this should never compromise efforts to preserve human life.
Furthermore, understanding the values of cultural heritage assets and its components represents a fundamental prerequisite for an appropriate disaster planning, response and recovery analysis. This information enables to establish priorities for the protection of a property and to guide fire brigades and civil defence officials to handle sensitive areas with care in responding to emergencies. The assessment of cultural heritage values can also help clarify property losses and priority needs for stabilizing and securing the property and its constituent elements during post-disaster processes. Following a disaster, every effort should be made to ensure the retention and repair of structures that have suffered damage. For such reason, it is also important that the response plan for the property identifies in advance individuals capable of being called upon rapidly for such assessments which should then result in recommended measures for immediate and urgent stabilization and protection of cultural heritage. Finally budget provisions for such stabilization should be part of advance planning for improving property disaster-preparedness.

2.2. Currently enforced strategies in Central Europe and past changes

Risk management and resilience strategies need to continuously adapt to the variability of weather conditions, the worsening of extreme natural events and the increasing vulnerabilities of cultural heritage assets. The dynamism of the risk factors involved imposes therefore the enforcement of adequately flexible measures able to prevent, cope with and recover from natural disasters. The measures are usually categorized in structural (physical) and non-structural (organizational) ones. In this report, however, risk management strategies are sorted according to the phases which precede, concur and follow the impact of an extreme event.

2.2.1. Currently enforced strategies in Central Europe

The risk management strategies currently enforced in Central European countries for the protection of cultural heritage against the negative effects of extreme events can be summarised as follows:

1) <u>Strategies aimed at improving preparedness for cultural heritage as well as at risk prevention and mitigation.</u>
- These include pre-impact activities that provide the trained personnel, plans, procedures, facilities and equipment needed to support active response at the time of disaster impact. Measures currently enforced promoting these objectives include training courses, on-site disaster simulations and access routes planning for emergency vehicles. Ongoing rehearsals and simulations are important to ensure readiness for use of the plan in the event of an emergency. Further activities intended to raise awareness among the involved stakeholders are also commonly implemented in preparation to an extreme event (e.g. seminars and lectures, media campaigns). Preparatory measures in support of the response plan commonly include also documentation activities such as inventories and databases, records and registers of heritage structures. Risk assessment is a fundamental requirement for drafting a comprehensive and accurate emergency response plan and therefore is usually considered in the

preparedness planning. Risk mapping is in fact often considered a part of preparedness measures to reduce the impact of disaster.
- This group of strategies also include those which attempt to avoid the adverse impacts of extreme events through actions that reduce hazard, exposure, and vulnerability acting on cultural heritage properties. The measures currently enforced mainly aim at reinforcing the ability of a property to resist or contain the consequences of disaster. These include efforts to strengthen a structure and its parts or to reduce its vulnerability to particular hazards. Examples can be water damage prevention devices such as drainage ditches, dams, flood gate, spillway, overflow channel, retrofitting of building components. Reduction of physical vulnerability is also achieved by enforcing revised building codes for example with increased safety factors.
- Preparedness strategies also aim at providing adequate warning of impending disaster such as sensors to record or predict the onset or likelihood of disaster. Examples include smoke detectors (to warn of fire), or networks of earthquake sensors intended to give advance indication of seismic activity as well as fire alarm systems.

2) Strategies focussing on the response to disaster or emergency
Response strategies and their effectiveness are highly dependent on the adequacy of preparedness measures such as appropriate response plans and training for occupants and emergency response personnel. Many actions taken during the response phase could also be understood as part of the early stages of recovery. The currently enforced response strategies in Central European countries include the following:
- Emergency management actions such as the activation of the coordinating team and the operative one. Communication is usually considered of extreme relevance and most measures are intended to ensure that all stakeholders have ready and immediate access to a response plan and are continuously updated during the immediate post disaster phase. In the context of cultural heritage protection, a list of qualified and available conservation professionals should always be available. Appropriate communication mechanisms should be in place to mobilize one or more members of a conservation team immediately following onset of the disaster, as needed.
- Response actions are commonly taken to assess and stabilize endangered cultural heritage during a complex emergency. Such actions commonly include inspecting, surveying and reporting in order to establish the damage or impact to the site and its components, as well as emergency actions taken to prevent people and the property from suffering further damage such as propping unstable walls, fencing etc.

3) Strategies intended to return to pre-event operations, also involving the repair and restoration of damaged cultural heritage assets.
This category includes measures taken to overcome physical, social, environmental and cultural losses, aligning with the principles of sustainable development, including rebuilding in a better way in order to avoid or reduce future disaster risk. The effectiveness of recovery measures is in large part a function of measures planned and implemented in advance of the disaster. The quality of mitigation activities, focused on reconstruction, for example, depend on the quality of documentation prepared for the building before loss. The strategies currently enforced in Central Europe concerning the recovery phase, focus primarily on mitigation measures, physical rebuilding actions and reinstatement of enhanced preparedness measures. These include:
- Strategies which mitigate the negative consequences of the disaster, involving actions by which the full negative impact of a disaster can be reduced or compensated for. Examples include exhaustive recording prior to demolition of unsafe building elements, efforts to stabilize structure and contents following a disaster, efforts to remove or undo negative consequences (e.g. to remove flood waters and debris), and provision of temporary housing to accommodate those who might have lost homes.
- Strategies intended to rebuild the physical components of the property and the social structure of those using the property and its community. These include activities focussed on the physical

reconstruction of buildings, neighbourhoods and infrastructure, as well as on the rebuilding of a sense of stability, well-being and purpose in the minds of those affected by the disaster. Examples here would include the reconstruction of a damaged structure, or the use of personal counselling to support the victims of loss.
- Strategies which reinstate and enhance preparedness measures. These involve the assessment of the adequacy of preparedness measures in place before the disaster, and the implementation of preparedness measures enhanced to reflect the lessons learnt. Monitoring programmes to evaluate risk-preparedness effectiveness are commonly enforced in order to achieve such improvements. The effectiveness of the various elements of this planning framework may be examined at local (site), municipal, regional and national levels.

2.2.2. Relevant past changes in policies in Central Europe

In the last decades the harshening of climate conditions and the increasing frequency of the occurrence of extreme weather events in Central Europe induced several changes in risk mitigation plans. The currently enforced strategies in Central Europe are in fact the final product of a series of such changes which involved five main aspects of risk management protocols:

1) Legal and administrative framework

The lesson learnt from previous extreme events occurred in Central Europe in the last years endorsed the following changes in the legal and administrative framework:
- The enforcement of lists of cultural heritage buildings, objects and monuments of interest. Copies of the lists are deposited and available to all the appropriate authorities. Owners of items on the lists should maintain their property in good condition, by means of structural surveys and by the implementation of regular maintenance and repair and of periodic risk assessment studies.
- Authorities responsible for the architectural heritage are given further administrative power to enforce measures to reduce risks which jeopardise the building such as the necessary surveys, maintenance and repair works to be undertaken.
- Risk assessment and planning has become a formal consideration in town planning and land use.
- The concept of performance requirement has been introduced to building codes which now dictate the design and application of safety measures in built heritage. The performance requirements define in practice an optimum and flexible choice of organisational, technical and structural measures. The safety-standards and the technical regulations are hence fundamentally revised, especially in the fields of building regulations, flood and torrent control, early warning systems along the large rivers, fire precautions in buildings and public transport.

2) Finance and budgeting

Adequate and quickly accessible resources have been established both for planned maintenance, upgrading and preventive work and for contingency funding in the event of a disaster. Some Countries have introduced the obligation to create financial reserves in the budgets of local governments for restoring the damages and reconstruction in case of the occurrence of the emergency situation. Furthermore institutions are suggested to remove any legal obstacles and facilitate the insurance of buildings and objects, which comprise the architectural heritage, against loss and damage caused by disasters and against theft and arson. However, there is still paid little attention to assessment of monetary values of damage experienced on cultural heritage due to natural or man-made disasters.

3) Education and training

In order to improve risk awareness, education and training have been fostered and promoted at different levels: to the general public through informed media coverage and in the school systems as part of the academic courses offered; to the professionals and technicians through general training and in specialist courses; and, to owners and occupiers of the architectural heritage by the provision

of guidance. Education and training is now given a high priority and it is provided with an adequate level of resources. All the stakeholders are involved in information campaigns, rescue training courses and evacuation drills.

4) Risk assessment

As mentioned in the previous points risk assessment has been adopted and implemented as part of the maintenance of cultural heritage at a series of management levels, by owners, users and authorities responsible for the architectural heritage. For each of the natural hazards, it is essential to quantify and assess the probability of occurrence, notably through the production of distribution studies and zoning maps, according to time and space. Continuous monitoring of specific parameters, such as weather conditions and water level of rivers as an example, is implemented in risk assessment plans. Risk maps have been made a fundamental tool to design and plan activities related to CH protection and safeguard. Annual updates of action plans in disaster situation have been implemented followed by adjustments to local plans of spatial development and regulations of the municipality.

5) Disaster prevention and mitigation strategies

Disaster prevention and mitigation strategies can follow two main approaches, namely the reduction of the hazard (or the prevention of the occurrence of the disaster) and the reduction of the loss or damage which will result from the disaster. Prevention and mitigation strategies have been updated and reassessed. Risks are now reduced by the planned application of a choice of organisational, management, technical and structural measures which must be developed on a case-by-case basis for each building, according to each disaster.

3. BARRIERS AND CHALLENGES AFFECTING CULTURAL HERITAGE VULNERABILITY IN CENTRAL EUROPEAN COUNTRIES

A detailed investigation among the project partners unveiled typical barriers which influence vulnerability of cultural heritage on different territorial levels:

a) Site Level.

In Hungary decision support tools are not available in case of extreme events that directly affect the cultural heritage. Without decision support tools the management of protection cannot be effective. In the case of emergency, the first rescue service is the fire-brigade which often has no information about the cultural heritage assets and the value of the cultural heritage. In Poland the challenges to cultural heritage protection to be addressed at site level include: limited funds for maintenance and protection of the heritage buildings; low participation of public administration in co-financing; lack of funding from investors; low budgets of private owners; onerous and long procedures of application for financing and conservation works; exposure to acts of vandalism and to hooligans; cases of not regulated ownership of heritage buildings and low awareness of the necessity to protect the heritage buildings and objects. In Croatia the main problems, barriers and challenges involving cultural heritage protection at site level feature legal property relations, lack of data related to cultural threatened monuments, no awareness of inhabitants in threatened areas and the harshening of extreme events. In Slovenia the municipality of Kočevje has funds for urgent repair when an extreme event occurs. Nevertheless there is a lack of funds for regular maintenance and repair. Similarly private owners and the Catholic Church, who possess a relevant part of the stock of cultural heritage properties, do not have direct funds for repair but start to collect donations when an extreme event damages their property. In Italy the lack of financial means represents the main challenge to be addressed as commonly fund raising activities are required in order to ensure that damages induced by extreme

events are prevented or repaired. Finally in the Czech Republic local structural measures are available only to a limited extent due to low financial means, while related to non-structural measures it is reported a lack of insurance or incentive support for heritage owners as well as a low awareness which affects level of preparedness.

b) Regional level.

In Hungary the problems affecting resilience of cultural heritage assets at regional level feature primarily the lack of appropriate procedures related to the risk management. In Poland, similarly to the site level, the challenges include limited funds for maintenance and protection of the heritage buildings, low participation of public administration in co-financing; lack of funding from investors; low budgets of private owners; onerous and long procedures of application for financing and conservation works; exposure to acts of vandalism and to hooligans; cases of not regulated ownership of heritage buildings and low awareness of the necessity to protect the heritage buildings and objects. In Croatia the main problems, barriers and challenges involving cultural heritage protection at regional level feature legal property relations, lack of data related to cultural threatened monuments, no awareness of inhabitants in threatened areas, and the harshening of extreme events. In Austria the decentralised and broad range of stakeholders active in the field of cultural heritage conservation and protection leads to sometimes slow or un-coordinated approaches to apply contemporary safety-precautions and risk disaster mitigations instruments. In Italy, as highlighted for the previous site level, the lack of financial means represents the main challenge to be addressed as commonly fund raising activities are required in order to ensure that damages induced by extreme events are prevented. In Slovenia whenever cultural heritage assets are owned jointly by the municipality and the state, the latter normally asks the municipality for funds first imposing therefore an additional pressure on the local authorities. In the Czech Republic the lack of funds is also presented, inadequate knowledge of heritage in risk which prevents budget and measures planning.

c) National level

In Hungary the institutions which are responsible for the risk management usually have no resources for the rescue of cultural heritage exposed to the extreme events. Furthermore there exist no clear rules about the responsibilities in the context of cultural heritage protection. In Poland the challenges to be addressed at national level correspond to the ones outlined for the regional level with the following additions: financial sources to protect and restore damages are limited; certain regulations regarding renovation of heritage buildings are very strict and prevent people from carrying out proper maintenance due to the possible prosecutions. Consequently buildings with a recognised heritage status but privately owned, a quite frequent situation, can be found significantly damaged instead of maintained or renovated in cases where the private owner lacks funding. At the same time governmental support in renovating is close to none especially for individual owners. In the recent years the extreme weather characteristics observed, not typical for the Polish climate, represent a serious problem for older buildings which may not be resilient to the new conditions. They may require specific changes in the main structure, roofing, and façade structures. Additionally, extreme weather in combination with pollution contributes to further increase the deterioration factors acting on cultural heritage properties (e.g. acid rains in Krakow corroding the stone sculptures). In Croatia due to the lack of cooperation between institutions responsible for preventive measures, policies are related to areas and specific basic infrastructure, public sites, areas. Cultural heritage is not usually approached in a specific way as a separate field. However cultural heritage does have a dedicated legislation regulating preservations and protection actions, but due to great numbers of protected cultural sites and lack of financial sources many buildings, archaeological sites, cultural areas are under great risk of devastation as well as extreme events (fire, flood, sea rise). In Slovenia, as for the regional level, the main problem is represented by the fact that whenever cultural heritage assets are owned jointly by the municipality and the state, the latter normally asks the municipality for funds first imposing therefore an additional pressure on the local authorities. In Austria disaster risk

prevention and management instruments are subject of provincial legislation. Consequently, the speeds of implementation as well as the legal and technical standards differ from province to province. In Italy, similarly to the previous two levels, the lack of financial means represents the main challenge to be addressed as commonly fund raising activities are required in order to ensure that damages induced by extreme events are prevented.

The challenges outlined above appropriately describe the current situations concerning cultural heritage protection strategies in each country considered. In addition to these, in the perspective of a possible framework of transnational resilience and risk management of cultural heritage exposed to extreme events, the following issues can be highlighted: firstly there are differences in the recognition of the national heritage artefacts or sites resulting from various cultural background and various regulations. Although there exist principles which are broadly accepted and implemented, technical standards and legal regulations might differ among Central European countries such as for example compensation regulations or criminal and financial responsibilities. Moreover, different levels of equipment, training and of expertise could cause problems for the transnational cooperation in the protection of cultural heritage. Finally, documents and records, particularly at local and regional scales, are usually drafted in a language other than English inducing a communication barrier which prevents knowledge sharing and information processing at a Central European level.

The intrinsic challenges concern mainly the physical weaknesses of CH properties (e.g. wooden building components in flood situation, slender tall members subjected to strong wind etc.) as well as their managerial vulnerability (e.g. lack of maintenance, inadequate decision making, poorly designed emergency or post-disaster plans, lack of funds etc.), which make them prone to damage from extreme events. They further affect the way cultural heritage assets are protected and the manner their resilience and risks are managed. The found results are summarized in the conclusion.

4. EFFECTS OF EXTREME EVENTS ON CENTRAL EUROPEAN CULTURAL HERITAGE

This section of the report outlines the type of extreme events observed in Central Europe. Three different scales are considered namely local, regional and national. The first refers to the scale of the pilot sites selected as case studies for the ProteCHt2SAVe project which include Pécs (Hungary), Bielsko-Biala (Poland), Ferrara (Italy), Kočevje (Slovenia), Kaštela (Croatia), Krems (Austira) and Troja (Czech Republic). The second scale refers to the region in which the pilot sites are located while the third scale refers to the country in which the site are including Hungary, Italy, Poland, Czech Republic, Austria, Slovenia and Croatia. Observed and expected damages due to the occurrence of extreme events are summarized and recent experiences are presented in the last part of this section.

4.1. Extreme events considered

Extremes weather events in Central European countries vary in frequency, duration and magnitude according to the geographical location considered. This paragraph provides an overview on the natural events recorded in different Central European countries considering site, regional and national scales. The extreme events commonly experienced include:

- Earthquakes.
- Flood (flash, river, tidal).
- Strong wind (varying in wind speed and frequency).

- Precipitation (rain, hail, snow).
- Landslide (or mud flow, avalanche).
- Fire (if yes specify type – wildfire, accidental).
- Draught.
- Other (e.g. weathering damage due to salt, temperature fluctuations, icing...).
- Multiple events, sequential events (e.g. wind driven rain, wind + fire, etc.).

4.2. Effects of extreme events

This section of the report presents the main damages observed on sites or landscapes, built heritage and movable heritage in Central Europe. These can be characterised by different extent grading and estimates of monetary loss. The most commonly observed damages are:

Site or landscape:

- Erosion
- Earth deposition
- Forest, park or cemeteries damage
- Individual trees damage

Built heritage:

- Roof damage
- Façade damage
- Primary structure damage
- Secondary structure damage
- Sculptures and monuments damage

Moveable heritage:

- Damage to furniture and music instruments
- Damage to objects of art
- Damage to books and paper
- Damage to glass and ceramic objects
- Damage to family heritage (collections, photographs etc.)

Selected examples are presented in the Annex.

5. CONCLUSIONS

The present deliverable identifies the situation and critical elements which can be subject of improvement, in the resilience and risk management of cultural heritage exposed to extreme events. In particular it grounds on the experience from past natural disasters and the vast knowledge derived from the existing approaches to vulnerability and resilience measures around Central Europe. From this report the conclusions outlined in the next paragraphs can be made.

5.1. Risk management situation

The enforced resilience and risk management strategies in central European countries include:

1) Strategies aimed at improving preparedness for cultural heritage as well as at risk prevention and mitigation such as training, documentation and communication activities, structural strengthening and early warning systems.

2) Strategies focussing on the response to disaster or emergency including coordination and management, rehearsals and simulations.

3) Strategies intended to return to normal operations, also involving the repair and restoration of damaged cultural heritage assets including actions aimed at mitigation, physical rebuilding and reinstatement of enhanced preparedness.

The currently enforced strategies in Central Europe are the result of a series of changes or adjustments in the past which involved five main aspects of risk management protocols:

1) Legal and administrative framework: enforcement of lists of cultural heritage assets; strengthening the administrative power of responsible authorities to enforce measures to reduce risks; risk assessment and planning has become a formal consideration in town planning; the concept of performance requirement has been introduced to building codes which now dictate the design and application of safety measures in built heritage.

2) Finance and budgeting: adequate and quickly accessible resources; obligation to create financial reserves in the budgets of local governments; facilitating the insurance of cultural heritage buildings and objects

3) Education and training

4) Risk assessment

5) Disaster prevention and mitigation strategies

5.2. Typical disasters and impact in the Central Europe

Extreme events commonly experienced in Central Europe slightly vary in frequency, magnitude and duration among the considered countries as well as depending on whether local, regional or national levels are considered. The extreme events investigated are: earthquakes; flash, river or tidal floods; strong winds; precipitation,; mud flow and avalanche; wildfire or accidental fire; draught; weathering (salt, temperature fluctuations, icing, ..); multiple events; sequential events such as wind driven rain. The related damages observed on sites or landscapes, built heritage and movable heritage in Central Europe are the following: as far as sites or landscapes are concerned, erosion, earth deposition, forest of park damage and individual trees damage have been recorded; on built heritage, roof and façade damage, primary and secondary structure damage have been observed; moveable heritage experiences mainly damage to furniture and music instruments, to objects of art, to books and paper, to glass and ceramic objects and to family heritage.

5.3. Typical barriers and challenges in the Central Europe

Challenges and barriers in Central Europe are outlined at three different levels, namely site, region and country. The most relevant issues evidenced in this report involve the following aspects:

a) Lack of appropriate procedures related to the risk management such as decision support tools.

b) Lack of data, as often no information about the cultural heritage assets and their location, condition and values are available.
c) Lack of funds or limited accessibility to financial resources: limited funds for maintenance and protection are commonly reported with lack of funding from investors, low budgets of private owners and no resources for the rescue of cultural heritage; furthermore onerous and long procedures of application for financing and conservation works and low participation of public administration in co-financing further exacerbate this issue.
d) Lack of knowledge: low or no awareness of involved stakeholders is underlined as a challenge for implementing adequate risk prevention and mitigation strategies.
e) Property status issues: in some cases the ownership of cultural heritage buildings is not regulated; properties owned jointly by the municipality and the state, for example, imposes additional financial burdens to the local authorities which are asked by the state for advanced funding schemes.
f) Problems with regulations: rules regarding renovation of heritage buildings can be very strict creating an obstacle for risk management strategies. At the same time in some cases cultural heritage lacks a specific approach.
g) Lack of coordination among stakeholders: the broad range of stakeholders active in the field of cultural heritage conservation and protection leads to sometimes slow or un-coordinated approaches to apply contemporary safety-precautions and risk disaster mitigations instruments; no clear rules about the responsibilities is often reported. In the case in which disaster risk prevention and management instruments are subject to provincial legislation, the speed of implementation is affected largely by the fact that legal and technical standards differ from province to province.
h) Harshening of hazard levels: the changing extreme weather characteristics observed represent a serious problem for older buildings which may not be resilient to the new environmental conditions imposed. Vandalism can also be included under this issue.
i) Low resilience awareness and lack of historic environment resilience supporting approach.
j) No transnational resilience and risk management of cultural heritage exposed to extreme events experience. Assumed problems varying from divergences in technical and legal frameworks to differences in the availability of resources and expertise as well as a language problem which might characterise the sharing of specific documentation related to cultural heritage.

The findings outlined above provide deeper insights on mitigation and adaptation strategies and measure-oriented data constituting the basis for the design of eco-innovative and effective solutions which will be formulated in other activities of the proteCHt2SAVE research project as well as in other deliverables of WP T2.

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7. ANNEX

Site/landscape:

- Forest or park damage:

Pécs, Hungary; due to an intense snowing on April 2017 numerous trees and branches fell down, 250 hectares were affected in total.

-Erosion:

Dunaszekcső Castle Hill, Hungary: soil degradation of the archaeological place due to the loess movement. The damages are unrecoverable.

Built heritage:

-Roof damage:

-Façade damage:

A gas explosion in Pécs, Hungary damaged the façade of a cultural heritage building in Király Street on 14 November 2017. The front of building was totally destroyed; the cost of renovation was 70.000 EUR.

- Primary structure damage:

Palkonya, Hungary cultural heritage cellars: due to the heavy rain on July 2007 one press house got in to unusable condition. The cost of renovation is 60.000 EUR.

-Secondary structure damage:

-Fire:

Hungary is not rank among the most flammable county in Hungary. There are some vegetation fires in early spring and summer. Thanks to the climate change more woods fire are observable.

-Earthquake damage

Ferrara, Italy: Este Castle after earthquake (2012) and after restoration (2013).

-Heavy rain damage

Ferrara, Italy: heavy rain caused light damages represented by temporary flooding, due to the poor maintenance of the drainage systems. As rainwater is kept in the shared sewer with the blackwater, coming from the urbanized area, the two are mixed together and are afterwards channelled in a single sewage treatment plant, making the outflow of the rainwater extremely slow and creating spillages out of the storm drains. It gets impossible to use them for others functions, such as the simple and direct discharge in tanks, e.g. the river Po di Volano, or even using tanks of laminations. Although no heavy damage has been recorded to date, the increasing number and intensity of the phenomenon heightens the probability of negative consequences. Among other problems these circumstances can cause harm to the tourism economy.

Hungary, heavy rain causes damages in hilly area. Freezing rain causes lot damages in the roofs and windows of buildings and agriculture, cars.



-Sea tide damages

Kaštela, Croatia




-Flooding damage

Kočevje, Slovenia: The last catastrophic flood occurred in 1973 when factories and schools were closed for three days, local people were short-term evacuated, most of the factories were flooded, crops were destroyed, drinking water supply was disabled, and the main road was closed for three days. After the flood in 1973 a water retention reserve in Zalužje near Prigorica was planned and constructed in 1986. After that there were no major floods of the elevated water level of the Rinža River. Below, clockwise from top left: flood in 1912, 1933, 1966 and 1973.

Today in Kočevje the main threat for built heritage sites is rain and storm. Heavy rain causes regular flooding of cellars in cultural heritage buildings in the city centre. Regular city flooding of the buildings threatens the safety of building's foundation. The provincial museum Šeškov dom was recently renovated and has no cellar so it is safe from flooding. Its roof was already damaged by storm and heavy wind, most recently in December 2017. Heavy wind is becoming a more regular phenomenon in the region making adaptations to roofs of cultural heritage buildings necessary. Below the regular city flood occurred in 2010.